

# Impact of a community sexually transmitted infection/HIV intervention project on female sex workers in five border provinces of Vietnam

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**Objectives:** To determine changes in the prevalence of sexually transmitted infection (STI)/HIV in female sex workers (FSWs) after a community HIV prevention intervention project in five border provinces of Vietnam. **Methods:** The project focused on providing user-friendly STI services for FSWs using mobile teams operating at multiple sites depending on local client preferences. 911 FSWs were enrolled at baseline and 982 in the exit survey. Study participants were interviewed about sociodemographic characteristics, sexual behaviour, history of STIs and selected features of their husbands or cohabiting partners, and were tested for STIs.

**Results:** The overall prevalence rates of HIV, syphilis, herpes simplex virus 2 (HSV-2) antibodies, gonorrhoea (GC), *Chlamydia trachomatis* (CT), and GC and/or CT among FSWs in the five border provinces in 2004 were 3.6%, 12.9%, 24.9%, 2.9%, 9.1% and 11.3%, respectively. Compared with baseline values, GC and/or CT decreased significantly from 19.9% to 11.3%, GC from 10.7% to 2.9% and CT from 11.9% to 9.1%. HIV decreased from 4.5% to 3.6%, and HSV-2 antibodies from 27.7% to 24.9%. After adjustment for possible confounders, a significant overall decrease in having GC and/or CT (OR=0.46, 95% CI 0.33 to 0.65;  $p<0.001$ ) and GC alone (OR=0.22, 95% CI 0.13 to 0.37;  $p<0.001$ ) was found, and the overall prevalence of syphilis increased significantly (OR=1.55, 95% CI 1.11 to 2.17  $p=0.011$ ). A marked increase in syphilis from 1.0% to 14.1% was identified in the Lai Chau province.

**Conclusions:** Implementation of the project was associated with a reduction in GC and/or CT infections in FSWs, more so with GC than with CT. A notable increase in syphilis in Lai Chau was identified. HIV/STI interventions in FSWs can be implemented by government services and should be intensified and expanded to other provinces.

High prevalence of sexually transmitted infections (STIs) have been implicated in the spread of HIV in some Asian countries,<sup>1</sup> and successful STI prevention programmes have had a major effect in reducing the spread of HIV in Thailand and Cambodia.<sup>2–3</sup> HIV prevention programmes targeted at female sex workers (FSWs) are therefore justified, and are one of the most cost-effective interventions identified.<sup>4</sup> In Vietnam, the HIV epidemic is mainly associated with injecting drug use and sex work,<sup>5–7</sup> both of which are regarded as social evils by the Ministry of Labour, Invalid and Social Affairs.<sup>8</sup> This has meant that HIV prevention and treatment programmes for FSWs and injecting drug users in the community have been difficult to implement.

Mobility is also a recognised risk factor for the spread of STIs and HIV in Southeast Asia.<sup>9–10</sup> This regional community intervention HIV prevention project was therefore designed to target selected border provinces in three neighbouring countries, Vietnam, Cambodia and Laos, with an extensive HIV prevention package including information, education and communication, condom promotion and improved STI control in the general population and FSW. In Vietnam, the project was implemented in five border provinces, with a particular focus on improving STI care for FSWs. This study reports on the steps implemented and the changes in the prevalence of STIs at the time of project completion compared with baseline levels. The project recognised the need for innovative methods in limiting the risks of HIV in FSWs in Vietnam, and was implemented through the AIDS Division of the Ministry of Health (MOH).

## METHODS

### Project background: what was implemented?

The Japan Fund for Poverty Reduction (JFPR)-9006 community-based HIV prevention project sought to provide a comprehensive set of activities to limit HIV transmission in selected districts of five border provinces—Lai Chau in the north, bordering with China, Quang Tri in the centre, bordering with Laos and Dong Thap, An Giang and Kien Giang in the south, bordering with Cambodia. Provincial AIDS authorities and offices were involved in planning and implementing all activities through a central monitoring system administered by the MOH. The following three main groups of activities were implemented:

1. Behaviour change communication activities for host communities and mobile populations: this involved targeted information and advocacy plans to ensure widespread community knowledge of HIV/AIDS in relation to both protection from and living with the infection. FSW peer educators were engaged for HIV prevention activities, and to promote STI-related health-seeking behaviour.
2. Condom promotion using social marketing: this was targeted at local populations, using the 100% condom use

**Abbreviations:** CT, *Chlamydia trachomatis*; DFSW, direct female sex worker; FSW, female sex worker; GC, gonorrhoea; HSV, herpes simplex virus; MOH, Ministry of Health; PPT, periodic presumptive treatment; STI, sexually transmitted infection; VND, Vietnam dong

framework where appropriate to gain the participation of local authorities and those involved in the management and control of sex entertainment services. The process applied commercial marketing skills and techniques for the social good through non-governmental, for-profit channels. This social marketing did not replace the existing free distribution, but was an addition. Condoms were promoted through commercial channels such as tobacco stalls, coffee or tea shops, pharmacies, beer outlets, hotels and restaurants. Transport hot spots and construction sites received special attention.

3. Care and management of STI: facilities for STI diagnosis and treatment were strengthened by improving health provider skills through training and provision of STI diagnostic equipment. Demand was also strengthened, and social barriers to using STI services reduced. Innovative services were designed to provide user-friendly STI care services at the province level. Each province set up mobile teams to deliver STI care in settings that FSWs were comfortable with, including their place of work.

Further details can be found on the project website <http://www.jfpr-hiv.org>.

### STI/HIV surveys

Two field surveys were done in the five border provinces. The results of the first (baseline) survey among 911 FSWs held during December 2002–January 2003 are reported elsewhere.<sup>11–14</sup> All participants in the baseline survey were offered azithromycin 2 g stat dose to cover possible cervical infections with gonorrhoea and CT. In December 2004, 982 FSWs were sampled from the same provincial districts as the first survey. FSWs were identified using mapping information obtained through a similar methodology as in 2002, to identify locations where FSWs were likely to be found. Study participants were classified into two types: direct female sex workers (DFSWs) working from streets, parks, bus stops, boats, ferry piers, brothels and guest houses, and indirect female sex workers with jobs and selling sex in hotels, restaurants, massage parlours, cafes, karaoke lounges, bars and barbershops.

The sample size at baseline was calculated using STATCAL of EPI-INFO V.6.04d (CDC, USA and WHO, 2001), with the following parameters: estimated prevalence of outcome of interest (GC and CT,  $p = 25\%$ ), CI ( $1 - \alpha = 95\%$ ), precision ( $d = 5\%$ ), and an additional 10% for refusal, damage or loss of specimens. The sample size was then proportionally stratified by the number of estimated FSWs in each district and province estimated from previous mapping.<sup>11</sup> However, a list of FSWs could not be obtained at each site (restaurant, bar, etc), and hence FSWs were recruited by convenience sampling. Interviewers asked either the owners of establishments or the FSWs themselves to identify participants suitable for the study. Informed verbal consent was obtained from all participants before they were interviewed, using a standard schedule in Vietnamese as reported previously. Specimens for HIV and STI testing were collected and tested as reported previously, except that the Determine (Abbott, Tokyo, Japan) test was used as the initial screening test in 2004.

Data were entered into Epi-info V.6.04d. The percentage of FSWs interviewed in the exit survey, who also participated in the baseline survey, was unknown. In the data analysis, “baseline” and “exit” were considered as two groups “without” and “with” the intervention, respectively. Odds ratios (ORs) with 95% CI were used to measure the magnitude of the association between STI/HIV and the intervention (before and after). In the univariate analysis, differences in GC and CT were also stratified by type of sex work (direct or indirect).

Candidates for multivariate analysis included those variables that met one of the following three criteria: (1) biological

association with the outcome of interest; (2) previously shown to be associated with the outcome of interest in Vietnam<sup>12–15</sup>; and (3) significantly differed before and after intervention when screened by univariate analysis,  $\chi^2$  and Fisher's exact tests. Intermediate variables that may have changed as a result of the intervention (condom use, drug use, etc) were excluded from the full model.

Multivariate logistic regression analysis was done using Stata V.6.0. The regression was performed to determine the relationship between the intervention and different outcomes (GC and/or CT, GC, CT, HIV, syphilis and HSV-2) while controlling for the effect of confounders. The intervention variable was assessed in six different mathematical models using each of the above outcomes in one model. The likelihood ratio test was performed to compare the reduced model (without the variable of interest) with the bigger model (with the variable of interest). Variables were retained in the model if either the  $p$  value based on likelihood ratio test was  $\leq 0.05$  for a particular variable or the OR of the intervention variable increased or decreased by  $>10\%$  in the reduced model. The same process was repeated until there were no more variables in the model whose  $p$  value was  $>0.05$ .

The statistical power for the association between the intervention and STI/HIV was also calculated, using EPITABLE calculator of the EPI-INFO V.6.04d.

The study protocol and questionnaire were reviewed and approved by the AIDS Division, MOH, the Vietnam Commission for Population, Family and Children, Population and Family Health and the Pasteur Institute, Ho Chi Minh City, Vietnam.

## RESULTS

### Baseline survey

The results of the baseline survey are reported in other papers.<sup>11–14</sup>

### Selected social, demographical and sexual behaviours among FSWs and their partners in 2004

In all, 982 people participated in the final survey, 99% of whom agreed to give blood and 97% agreed to give urine for testing. Very few of those who were asked to participate declined. In all,  $>93\%$  of the study subjects were of Kinh ethnicity and almost 60% were aged 20–29 years (table 1). Also,  $>50\%$  of the participants had an average income of 1.2 million Vietnam dong per month (US\$80, £41.18, €60). Income in the south seemed to be higher than that in the north and the central provinces. The educational level of FSWs from the north and centre was higher than that of FSWs from the south. In general,  $>50\%$  of the study participants had a primary school (grade 1–5) education or were illiterate, with this figure being  $<50\%$  in the north and the centre. In all,  $>13\%$  of FSWs lived at the surveyed site for  $<6$  months, and  $<1\%$  of FSWs ever worked outside Vietnam. In An Giang, 1.8% of FSWs reported ever working in Cambodia.

In all, 16.5% of FSWs were cohabiting. The mean age of sexual debut was 18.7 years. About 50% of study subjects had worked as FSWs for  $<2$  years. Half of FSWs had four clients/week. More than 10% of FSWs practised oral sex, and  $<3\%$  had had anal sex.

Consistent condom use (100% in the last month) with clients, non-paying regular partners and husbands/live-in partners was 52.8%, 43.3% and 35.3%, respectively (table 2).

Approximately 46% of study participants were DFSWs. More than 18% of FSWs reported vaginal discharge in the last 12 months. The majority of FSWs (64.1%) bought medicines from drug stores to treat gynaecological symptoms. One-third of FSWs self-treated genital complaints. A quarter of FSWs douched every day. Overall 2% of FSWs reported injecting drug use ever, compared with  $>3.0\%$  in Lai Chau.

**Table 1** Selected sociodemographical features and sexual behaviour among female sex workers in five border provinces in Vietnam in 2004

Characteristic	Total n (%)	Lai Chau n (%)	Quang Tri n (%)	Dong Thap n (%)	An Giang n (%)	Kien Giang n (%)
Kinh ethnicity	979 (93.1)	99 (43.4)	99 (100.)	199 (99.5)	285 (99.3)	297 (97.0)
Age (year)	981	99	100	199	285	298
<15	0.2	0.0	0.0	0.0	0.0	0.7
15–19	18.7	23.2	16.0	14.1	17.2	22.5
20–24	38.1	44.4	19.0	31.2	43.5	41.9
25–29	20.7	20.2	14.0	24.6	22.5	18.8
>29	22.3	12.1	51.0	30.2	16.8	16.1
Average monthly income (million Vietnam dong*/month)	975	98	98	198	285	296
Mean	1.5	0.74	1.4	1.5	1.4	1.8
Median (range)	1.2 (0.05–10.0)	0.7 (0.2–1.6)	1.2 (0.09–3.0)	1.5 (0.3–5.0)	0.9 (0.2–8.0)	1.5 (0.05–10.0)
Low educational level (none or primary school only)	979 (50.8)	99 (37.4)	100 (34.0)	199 (47.7)	284 (53.5)	297 (60.3)
Residing in the province for ≤6 months	978 (13.3)	99 (28.3)	99 (17.2)	198 (11.6)	285 (6.3)	297 (14.8)
Ever worked outside the country	980 (0.8)	99 (0.0)	99 (1.0)	199 (1.0)	285 (1.8)	298 (0.0)
Marital status: cohabiting	980 (16.5)	98 (20.4)	100 (14.0)	199 (13.6)	285 (20.4)	298 (14.4)
Age at first sex (year)	891	98	93	156	260	284
Mean	18.7	18.2	19.9	18.8	18.6	18.4
Median (range)	18.0 (13–30)	18.0 (13–24)	20.0 (15–27)	18.0 (14–30)	18.0 (15–28)	18.0 (13–28)
Duration of work (months)	978	99	99	199	285	296
Mean	34.1	24.1	37.3	32.0	36.9	35.2
Median (range)	24.0 (1–330)	17.0 (3–210)	18.0 (1–330)	24.0 (1–228)	25.0 (1–252)	25.0 (1–223)
Average number of clients per week	828	82	92	132	268	254
Mean	5.6	6.5	3.9	3.7	5.5	6.8
Median (range)	4.0 (0.0–62.0)	6.0 (1.0–20.0)	4.0 (1.0–12.0)	3.0 (1.0–12.0)	4.0 (0.0–21.0)	4.0 (0.0–62.0)
Mode of sex practice (at least one mode)	973	99	100	192	284	298
Vaginal	99.5	100.0	100.0	100.0	99.6	98.7
Oral	11.7	28.3	18.0	14.1	8.8	5.4
Anal	2.5	3.0	12.0	2.6	0.4	1.0
Vaginal discharge	924, 18.4	98, 29.6	100, 20.0	169, 10.7	281, 14.9	276, 22.1
Management of vaginal discharge (≥1)	170	29	20	18	42	61
Hospital	35.9	10.3	45.0	27.8	45.2	41.0
Private clinic	50.6	37.9	50.0	94.4	23.8	62.3
Medicine from drug store	64.1	79.3	25.0	61.1	57.1	75.4
Condom use	60.6	79.3	35.0	50.0	31.0	83.6
Traditional medicines	5.3	0.0	0.0	0.0	2.4	13.1
Self-treatment	31.2	89.7	25.0	11.1	23.8	16.4
No sex	34.1	24.1	10.0	72.2	26.2	41.0
Douching in the last month	708	58	12	78	276	284
Never	28.1	29.3	25.0	78.2	33.3	9.2
1–3 times/month	12.6	17.2	33.3	9.0	14.1	10.2
1–2 times/week	23.7	27.6	0.0	9.0	33.0	19.0
≥3 times/week	8.8	13.8	8.3	1.3	7.6	10.9
Daily	26.8	12.1	33.3	2.6	12.0	50.7
Number of FSWs who ever injected drugs	969 (2.0)	98 (3.1)	98 (2.0)	197 (0.0)	285 (2.1)	291 (2.7)

FSWs, female sex workers.

\*1US\$ = 15 000 (£7 724.9, €11 263.4) Vietnam dong.

Nearly 64% of husbands or live-in partners of FSWs were aged ≥30 years, compared with 48% of non-paying regular partners of FSWs. In these two populations, approximately 18% had jobs requiring them to move frequently (eg, drivers, boatmen). A history of injecting drug use ever among spouses and non-paying regular partners was reported by 7.7% and 2.1% overall, compared with 42.9% and 10.0% in Lai Chau.

### Selected social demographical and sexual behaviours among FSWs and their partners before and after intervention (2002 and 2004)

Table 3 compares the differences in demographical risk factors and sexual behaviour among FSWs between 2002 and 2004. Significant differences were found in age, number living alone, educational attainment, duration of sex work, income, number

**Table 2** Univariate analysis comparing differences in selected behavioural variables and reported symptoms in partners of female sex workers between 2002 and 2004

Characteristic	2002		2004		OR (95% CI)	p Value
	n	%	n	%		
100% condom use with clients	892	45.3	836	52.8	1.35 (1.12 to 1.63)	0.002
100% condom use with husband/live-in partner	238	9.2	170	35.3	5.33 (3.13 to 9.30)	<0.001
Complaint of burning or pain during sex with husband/live-in partner in the last 3 months	214	6.5	159	1.9	0.28 (0.06 to 0.91)	0.033
Reported urethral discharge in husband/live-in partner in the last 3 months	205	2.4	156	0.6	0.26 (0.01 to 1.89)	0.241*
100% condom use with non-paying regular partner	272	20.6	208	43.3	2.93 (1.97 to 4.41)	<0.001
Complaint of burning sensation or pain during sex with non-paying regular partner in the last 3 months	225	4.9	154	1.3	0.26 (0.04 to 1.05)	0.060
Reported urethral discharge in non-paying regular partner in the last 3 months	215	3.7	151	0	0.00 (0.00 to 0.63)	0.023*

\*Fisher's exact test.

of clients, ever worked outside Vietnam, ever injected drugs and having a non-paying regular partner.

Several selected sexual behaviour and STI-related symptoms in husbands/live-in partners and non-paying regular partners of FSWs were also significantly different between preintervention and postintervention evaluations. Overall, the rate of condom use with any partner increased significantly. Burning sensation or pain during sexual intercourse decreased significantly for husbands/live-in partners, and marginally significantly for non-paying regular partners. Urethral discharge also declined in both these groups, but more so in non-paying regular partners (table 2).

### Overall prevalence of HIV and selected STIs before and after intervention

GC and/or CT decreased significantly (from 19.9% to 11.3%,  $p < 0.001$ ; table 4). GC decreased from 10.7% to 2.9% ( $p < 0.001$ ), and CT also significantly declined from 11.9% to 9.1% ( $p = 0.04$ ). HIV decreased from 4.5% to 3.6%, and HSV-2 antibodies from 27.7% to 24.9%, but neither of these was significant. Syphilis increased from 10.7% to 12.9%, but not significantly. The reduction in CT between preintervention and postintervention varied between DFSWs and indirect FSWs, with a greater reduction in the former, from 12.3% to 7.0% ( $p = 0.01$ ; data not shown).

In the baseline survey, 25.8% of GC cases had CT and 23.1% of those with GC had CT. The corresponding prevalences in the exit survey were 25% and 8%, respectively.

### Multivariate analysis

After adjusting for potential confounders including province, having either GC and/or CT (OR = 0.46, 95% CI 0.33 to 0.65;  $p < 0.001$ ) and GC alone (OR = 0.22, 95% CI 0.13 to 0.37;  $p < 0.001$ ) were reduced significantly (table 5). The overall prevalence of syphilis was increased (OR = 1.55, 95% CI 1.11 to 2.17,  $p = 0.011$ ). Otherwise, there were no significant changes in chlamydia alone, HIV or HSV-2.

### DISCUSSION

As with any large-scale intervention project implemented primarily by the MOH, the results of the surveys undertaken here indicate a real-life experience in the field, rather than the results of well-defined intervention and control groups. However, in the absence of control groups, it is difficult to ascribe the reduction in GC and/or CT directly to the project. Also, the baseline survey may have accounted for some of the beneficial effects identified: all FSWs enrolled were offered treatment with azithromycin, and the process of participation in the interview and questionnaire may have accounted for behavioural change that was not measured directly. However,

**Table 3** Univariate analysis comparing differences between 2002 and 2004 in selected sociodemographical and behavioural characteristics of female sex workers and their partners

Characteristic	2002		2004		p Value
	n	%	n	%	
Ethnicity: Being Kinh	907	91.1	979	93.1	0.110
Age $\leq 20$ years	911	23.6	981	28.1	0.025
Marital status: living alone (single, widowed, separated, divorced)	911	73.9	980	83.5	<0.001
Educational background: illiterate/primary school	908	60.1	979	50.8	<0.001
Duration of work, $\leq 6$ months	880	20.3	978	9.6	<0.001
Income $\leq 500,000$ VND/month	801	25.8	975	12.7	<0.001
Ever worked outside VN	898	4.1	980	0.9	<0.0001
Direct female sex worker	911	44.7	982	45.8	0.616
$\geq 9$ clients per week	908	23.1	827	17.5	0.004
Age at first sex $\leq 15$ years	862	3.7	888	3.9	0.803
Ever injected drugs	695	3.9	969	2.0	0.018
Age of husband/live-in partner $< 30$ years	249	28.9	170	36.5	0.103
Having a non-paying regular partner	911	52.4	982	21.3	<0.001
Age of non-paying regular partner $< 30$ years	277	53.1	206	52.4	0.889

VN, Vietnam; VND, Vietnam dong (1US\$ = 15 000 VND, £0.5419, €0.7508).



**Table 4** Sexually transmitted infection/HIV among female sex workers before (2002) and after (2004) intervention in five border provinces of Vietnam

Province		Lai Chau	Quang Tri	Dong Thap	An Giang	Kien Giang	Five provinces
<b>GC</b>							
2002	n (%)	20 (20.2)	25 (24.8)	11 (7.3)	17 (5.7)	24 (9.4)	97 (10.7)
2004	n (%)	5 (5.1)	2 (2.0)	2 (1.0)	8 (2.9)	11 (3.8)	28 (2.9)
OR (95% CI)		0.21 (0.07 to 0.57)	0.06 (0.01 to 0.24)	0.13 (0.02 to 0.53)	0.51 (0.20 to 1.18)	0.38 (0.18 to 0.79)	0.25 (0.16 to 0.38)
p Value		0.001	<0.001	0.002	0.11	0.008	<0.001
<b>CT</b>							
2002	n (%)	16 (16.2)	11 (10.9)	15 (10.0)	22 (7.3)	44 (17.3)	108 (11.9)
2004	n (%)	8 (8.1)	6 (6.0)	15 (7.5)	12 (4.4)	46 (16.0)	87 (9.1)
OR (95% CI)		0.46 (0.18 to 1.12)	0.52 (0.17 to 1.47)	0.73 (0.34 to 1.57)	0.58 (0.27 to 1.20)	0.91 (0.58 to 1.44)	0.74 (0.55 to 0.99)
p Value		0.08	0.21	0.42	0.14	0.69	0.044
<b>GC and/or CT</b>							
2002	n (%)	27 (27.3)	33 (32.7)	24 (16.0)	34 (11.3)	62 (24.4)	180 (19.9)
2004	n (%)	11 (11.1)	8 (8.0)	16 (8.0)	20 (7.4)	53 (18.5)	108 (11.3)
OR (95% CI)		0.34 (0.15 to 0.71)	0.18 (0.07 to 0.41)	0.46 (0.23 to 0.90)	0.62 (0.34 to 1.10)	2.84 (0.46 to 1.06)	0.51 (0.39 to 0.66)
p Value		0.004	<0.001	0.02	0.10	0.09	<0.001
<b>HIV</b>							
2002	n (%)	2 (2.0)	1 (1.0)	7 (4.7)	21 (7.0)	10 (4.0)	41 (4.5)
2004	n (%)	2 (2.0)	1 (1.0)	5 (2.6)	15 (5.3)	12 (4.1)	35 (3.6)
OR (95% CI)		1.01 (0.10 to 9.87)	1.01 (0.03 to 39.8)	0.53 (0.15 to 1.76)	0.74 (0.37 to 1.47)	1.04 (0.43 to 2.52)	0.79 (0.49 to 1.25)
p Value		1.0*	1.0*	0.28	0.39	0.93	0.303
<b>Syphilis</b>							
2002	n (%)	1 (1.0)	13 (12.9)	17 (11.4)	32 (10.7)	34 (13.4)	97 (10.7)
2004	n (%)	14 (14.1)	17 (17.0)	19 (9.7)	40 (14.1)	35 (11.9)	125 (12.9)
OR (95% CI)		16.14 (2.8 to 351.3)	1.38 (0.63 to 3.09)	0.83 (0.41 to 1.69)	1.37 (0.83 to 2.27)	0.88 (0.53 to 1.46)	1.23 (0.93 to 1.63)
p Value		<0.001	0.41	0.61	0.21	0.61	0.154
<b>HSV-2</b>							
2002	n (%)	5 (5.0)	21 (20.8)	48 (32.2)	100 (33.3)	76 (29.9)	250 (27.7)
2004	n (%)	20 (20.2)	33 (33.0)	50 (25.5)	67 (23.6)	72 (24.6)	242 (24.9)
OR (95% CI)		4.78 (1.78 to 14.9)	1.87 (0.99 to 3.58)	0.72 (0.45 to 1.16)	0.62 (0.43 to 0.89)	0.76 (0.52 to 1.11)	0.87 (0.71 to 1.07)
p Value		0.001	0.05	0.17	0.01	0.16	0.175

CT, *Chlamydia trachomatis*; GC, gonorrhoea; HSV-2, herpes simplex virus type 2.

\* Fisher's exact test.

during its lifespan, the project was the only grant-assisted HIV prevention programme in the selected provinces. Such projects are becoming increasingly common in Asia as more large donors give aid-related resources directly to ministries to implement evidence-based best practice that can be applied to suit local needs.

There were several significant differences in both demographic and behavioural risk factors between the two surveys, which could indicate (1) changing patterns of sex work, (2) changes in mobility or (3) the consequence of the health education and HIV prevention components of the intervention, or a combination of all three. The first of these might explain the increased number of FSWs living alone, the decrease in those with non-paying sexual partners, and the decreased rates of illiteracy and those earning  $\leq$ US\$33/month (£16.99, €24.78); the second, might explain the decrease in number of FSWs working for  $<6$  months and those having worked in Cambodia, and the third might explain the reduction in the number of FSWs having  $\geq 9$  clients/week, increased condom use and decrease in STI-related symptoms among sexual partners of FSW.

There was a significant overall reduction in the prevalences of GC and CT after the intervention, which varied between the five provinces. The reduction in GC was nearly fourfold and far greater than the reduction in CT. The former finding warrants

further comment about how the different provinces approached the problem of STI control in FSWs.

In An Giang, where the prevalence of GC and/or CT at the end of the project was 7.4%, a periodic presumptive treatment (PPT) strategy with no laboratory tests was adopted, which involved treatment for all identified FSWs with azithromycin 1 g and cefixime 400 mg every 3 months. A successful PPT programme was implemented among service women in neighbouring Laos, and further evaluation of this strategy in the region is warranted in areas where quality STI services are limited.<sup>16</sup>

In contrast with An Giang, the other provinces either used mobile teams to perform Gram stains in areas close to the local STI clinic or trained healthcare workers to provide treatment for FSWs, based on risk assessment without lab tests at the primary healthcare or community level. A breakdown of the amount of STI treatment given by the mobile teams that mainly used doctors compared with other healthcare facilities was not recorded, but seemed to vary between the provinces. The findings from Kien Giang showed a minimal reduction in CT from 17.3% to 16%. In this province, treatment for CT was given only if the Gram stain was positive for GC, and risk assessment for the presumptive diagnosis was not used. Although risk assessment is well established and recommended by WHO, many specialist doctors in Vietnam have rejected it as

**Table 5** Multivariate analysis of changes in selected sexually transmitted infection prevalences in female sex workers before (2002) and after (2004) intervention

Variables		Outcome					
		GC and/or CT	GC	CT	Syphilis	HIV	HSV-2
Main exposure: intervention (before as a reference)	OR	0.46	0.22	0.81	1.55	0.73	1.03
	95% CI	0.33 to 0.65	0.13 to 0.37	0.56 to 1.17	1.11 to 2.17	0.41 to 1.30	0.80 to 1.31
	p Value	<0.001	<0.001	0.26	0.011	0.28	0.83
Potential confounders in the models							
Age ≤ 20 years	OR	1.22 <sup>*</sup>	1.30 <sup>*</sup>	1.44 <sup>RT</sup>	0.58 <sup>RT</sup>	1.44 <sup>*</sup>	0.44 <sup>RT</sup>
	95% CI	0.88 to 1.71	0.82 to 2.06	0.99 to 2.10	0.37 to 0.92	0.76 to 2.71	0.32 to 0.61
	p Value	0.23	0.27	0.057	0.02	0.26	<0.001
Ethnicity: being Kinh	OR	0.87 <sup>*</sup>	0.89 <sup>*</sup>	0.53 <sup>†</sup>	1.64 <sup>*</sup>	0.72 <sup>*</sup>	1.01 <sup>*</sup>
	95% CI	0.45 to 1.66	0.39 to 2.06	0.31 to 0.91	0.65 to 4.11	0.16 to 3.25	0.53 to 1.94
	p Value	0.67	0.79	0.022	0.30	0.67	0.98
Marital status: living alone	OR	0.60 <sup>†</sup>	0.53 <sup>†</sup>	0.71 <sup>*</sup>	1.92 <sup>†</sup>	1.07 <sup>M</sup>	1.31 <sup>*</sup>
	95% CI	0.40 to 0.91	0.28 to 0.98	0.43 to 1.18	1.34 to 2.75	0.55 to 2.09	0.98 to 1.74
	p Value	0.02	0.042	0.19	<0.001	0.84	0.065
Having a non-paying regular partner	OR	0.77 <sup>†</sup>	0.64 <sup>†</sup>	0.97 <sup>*</sup>	0.83 <sup>*</sup>	1.23 <sup>*</sup>	1.00 <sup>*</sup>
	95% CI	0.55 to 1.08	0.39 to 1.05	0.64 to 1.47	0.56 to 1.24	0.65 to 2.33	0.76 to 1.32
	p Value	0.13	0.076	0.88	0.36	0.53	0.99
Educational background: illiterate/primary school	OR	1.11 <sup>*</sup>	1.10 <sup>*</sup>	1.28 <sup>†</sup>	1.78 <sup>†</sup>	1.34 <sup>*</sup>	1.47 <sup>†</sup>
	95% CI	0.81 to 1.53	0.71 to 1.73	0.89 to 1.84	1.25 to 2.54	0.72 to 2.48	1.15 to 1.88
	p Value	0.50	0.67	0.18	0.001	0.35	0.002
Duration of work ≤ 6 months	OR	1.79 <sup>†</sup>	1.18 <sup>†</sup>	2.15 <sup>†</sup>	0.74 <sup>†</sup>	0.60 <sup>†</sup>	0.66 <sup>†</sup>
	95% CI	1.25 to 2.57	0.71 to 1.94	1.40 to 3.30	0.42 to 1.31	0.20 to 1.76	0.44 to 0.98
	p Value	0.001	0.53	<0.001	0.30	0.35	0.041
Income ≤ 500 000 VND/month	OR	1.45 <sup>†</sup>	1.19 <sup>†</sup>	1.59 <sup>†</sup>	1.34 <sup>†</sup>	1.99 <sup>†</sup>	1.02 <sup>†</sup>
	95% CI	1.02 to 2.05	0.74 to 1.92	1.05 to 2.41	0.88 to 2.03	1.08 to 3.68	0.75 to 1.38
	p Value	0.038	0.47	0.029	0.17	0.028	0.91
Type of sex work: direct sex worker	OR	0.87 <sup>*</sup>	0.66 <sup>†</sup>	0.89 <sup>*</sup>	2.08 <sup>†</sup>	1.60 <sup>*</sup>	1.48 <sup>†</sup>
	95% CI	0.64 to 1.18	0.43 to 1.01	0.62 to 1.28	1.48 to 2.90	0.91 to 2.81	1.16 to 1.88
	p Value	0.37	0.057	0.52	<0.001	0.105	0.001
≥ 9 clients per week	OR	0.91 <sup>†</sup>	0.67 <sup>†</sup>	1.00 <sup>†</sup>	1.37 <sup>†</sup>	1.77 <sup>†</sup>	1.27 <sup>†</sup>
	95% CI	0.62 to 1.35	0.37 to 1.23	0.64 to 1.58	0.93 to 2.01	0.97 to 3.23	0.95 to 1.69
	p Value	0.65	0.20	0.99	0.11	0.064	0.10
Ever worked outside Vietnam	OR	1.39 <sup>†</sup>	2.13 <sup>†</sup>	1.25 <sup>†</sup>	0.30 <sup>†</sup>	2.87 <sup>†</sup>	1.53 <sup>†</sup>
	95% CI	0.61 to 3.15	0.86 to 5.27	0.43 to 3.65	0.07 to 1.30	1.02 to 8.04	0.80 to 2.92
	p Value	0.43	0.10	0.68	0.11	0.045	0.20
Study sites							
Quang Tri (Ref)	OR	1	1	1	1	1	1
Lai Chau	OR	0.83 <sup>*</sup>	0.91 <sup>*</sup>	0.91 <sup>*</sup>	0.37 <sup>†</sup>	0.52 <sup>*</sup>	0.45 <sup>†</sup>
	95% CI	0.42 to 1.62	0.41 to 2.06	0.37 to 2.24	0.18 to 0.76	0.05 to 5.11	0.28 to 0.72
	p Value	0.58	0.83	0.83	0.007	0.58	0.001
Dong Thap	OR	0.45 <sup>†</sup>	0.23 <sup>†</sup>	0.88 <sup>*</sup>	0.53 <sup>†</sup>	3.32 <sup>†</sup>	0.98 <sup>*</sup>
	95% CI	0.28 to 0.73	0.10 to 0.50	0.42 to 1.85	0.29 to 0.94	0.99 to 11.11	0.63 to 1.53
	p Value	0.001	<0.001	0.73	0.03	0.052	0.95
An Giang	OR	0.45 <sup>†</sup>	0.29 <sup>†</sup>	0.71 <sup>*</sup>	0.53 <sup>†</sup>	4.45 <sup>†</sup>	0.88 <sup>*</sup>
	95% CI	0.31 to 0.66	0.17 to 0.51	0.36 to 1.40	0.31 to 0.90	1.52 to 13.01	0.58 to 1.33
	p Value	<0.001	<0.001	0.32	0.019	0.006	0.55
Kien Giang	OR	1.03 <sup>*</sup>	0.60 <sup>†</sup>	2.18 <sup>†</sup>	0.55 <sup>†</sup>	3.21 <sup>†</sup>	0.85 <sup>*</sup>
	95% CI	0.64 to 1.66	0.35 to 1.04	1.50 to 3.16	0.32 to 0.95	1.02 to 10.06	0.55 to 1.31
	p Value	0.91	0.07	<0.001	0.033	0.045	0.46

CT, *Chlamydia trachomatis*; GC, gonorrhoea; HSV2, herpes simplex virus type 2; VND, Vietnam dong.

\*Removed from final model.

†Retained in the final models.

unscientific and impractical to use because of the personal questions to patients involved.

Clearly, there are technical aspects of the management of STI control in FSW that must be addressed. Some of the mobile clinics would have been more effective if they had done no lab tests. Using Gram stains to diagnose cervical infections will only diagnose a limited number of GC infections (30–50%), because of the low sensitivity of this technique in women. If we assume a 30% sensitivity for diagnosing GC with the Gram stain, and a coinfection rate of 25% for GC and/or CT in our population, then the numbers of CT cases diagnosed and treated would be 7.5 or just 6.9% (75/108). Clearly, if the prevalence of GC was reduced further, as in the exit survey, the proportion of true CT cases treated correctly would also be reduced.

The prevalence of syphilis reported here indicate that syphilis is still an important problem in Vietnam. Although there is a case for PPT for syphilis with benzathine penicillin, this must be tempered with the possibility of penicillin allergies in non-infected FSW. The prevalence of syphilis in Kien Giang is sufficiently high to give such cause for concern that new syphilis treatment and prevention strategies should be initiated without delay in that province. The increase in syphilis in Lai Chau was unexpected, but could be explained by parenteral transmission among male injecting drug user clients in addition to transmission through commercial sex networks close to China, where syphilis has recently increased dramatically.<sup>17</sup> These data clearly indicate the potential for a new serious epidemic, and further intensive surveillance is warranted. For syphilis, routine rapid plasma reagin check-ups for all FSWs

should be implemented in STI clinics or by mobile check-up teams. New rapid tests for syphilis are now available, and should be introduced where syphilis is a significant problem.

The prevalence for HSV-2 antibodies seemed to be relatively low compared with Africa, but there is little data about HSV-2 in FSWs in both Vietnam and Asia. However, the low prevalence of HSV-2 antibody is a cause for optimism, given the role of this infection in facilitating HIV transmission.

The finding of a decreased prevalence of HIV is somehow encouraging. However, attributing this decrease to the project directly is difficult, given the degree of mobility of FSWs and the measurement method using prevalence index for a such chronic infection in a relatively short time (2 years).

There can be no doubt that the STI component of the project was better implemented in some provinces than others. Primary healthcare and commune settings were very popular with FSWs for treatment of STI, and provided a high standard of care. Their use should be encouraged and expanded with support directly from the MOH. Supervision at the national level was limited, and is an area that should be addressed if further projects are to be built on the successes shown here.

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